produces a perceptible but trifling effect, and the influence of the Earth and the other planets is insensible. Now it so happens that the periodic time of the meteors is related in a very remarkable way to those of *Jupiter* and *Saturn*, being nearly nine-eighths of the periodic time of *Saturn*, and still more nearly fourteen-fifths of the periodic time of *Jupiter*. Accordingly, in the fifty-three revolutions of the meteors which have taken place since A.D. 126, *Saturn* and they have six times repeated somewhat similar cycles of relative positions, each, moreover, *of a very special character*; and *Jupiter* and they have ten times repeated almost exactly the same cycle of relative positions. Now, where simple numerical relations of this kind subsist, the situation of a meteor along the orbit—viz. whether it is near the head or the tail of the meteoric stream, still more if it be an outlying meteor in front or behind—is likely to have an appreciable effect on the apsidal shift which its orbit suffers. It is, therefore, of great importance to determine whether any such differences between the apsidal shift of meteors variously situated can be observed, in order that the observed amounts may be compared with those calculated on the supposition that Le Verrier's hypothesis is true. If the calculated and observed amounts accord, Le Verrier's hypothesis will be proved; if they do not accord, it will be disproved: in either case we shall know more about the history of the meteors than we do now.

Hence the great importance of this year commencing the task of determining the exact radiant points of different portions of the swarm, and the approximate times of their apparition in our atmosphere, so as to furnish to mathematicians the requisite data for their calculations. In this work it is obvious that eye observations should, as far as possible, be replaced by photographs.*

Galactic Longitude and Latitude of Poles of Binary-Star Orbits.

By Alice Everett.

The data upon which the accompanying table is founded are not satisfactory. In the case of a very few stars there seems little doubt that the orbit determined is substantially correct, and in the case of a few more the elements obtained by different computers show some agreement. These will be recognised in the list by those familiar with the subject. But the greater number of orbits computed seem to be very uncertain.

From the results, such as they are, it does not seem that any decided tendency on the part of the poles of the orbits to favour any special region of the sphere can reasonably be deduced. (See summary appended to tables.)

* A popular account of the discoveries made in connection with the last visit of the November meteors will be found in the Journal of the Royal Dublin Society of 1869 April 3, and in the Proceedings of the Royal Institution of 1879 February 14; and appended to it there is a list of the original memoirs in reference to the advances which were then made.

The stars considered were the following :—

(1) Those for which I could find orbits published since 1890.

(2) Those of period less than 100 years, the orbits of which have not since been re-computed (fifteen in number), given in Mr. Gore's "Catalogue of Binary Stars for which Orbits have been computed" (published in 1890).

The latest orbit has been taken for each star when more than one exists. A few more obviously doubtful or fallacious orbits have been omitted.

I have collected the elements of 73 orbits of 45 stars published since 1890.

The computed galactic longitudes and latitudes of the poles of the orbits are given in the final columns of the table. There are two alternative results for each pole, corresponding to the two possible positions, equally inclined to the line of sight, for the plane of the orbit. The pole whose latitude is the lesser is placed first.

The R.A.'s and Decl.'s of the poles are shown in preceding columns, but here the result is given first for the case where i, the inclination, is assumed positive ; second, where it is assumed negative. Hence the pole entered first in these columns is not necessarily that entered first in the columns containing the galactic coordinates.

The position assumed for the northern pole of the Milky Way was R.A. 190° 31′, Decl. + 27° 16′ (1890), as according to Gould, which gives 62° 7′ as the inclination of the central line to the equator and $18^h\ 42^m = 280°\ 31'$ as the R.A. of the ascending node, from which the galactic longitudes are reckoned.

Not knowing that formulæ for finding the R.A. and Decl. of the pole of an orbit had been published (Mr. Marth has since referred me to Encke's article in the *Berliner Astr. Jahrbuch* 1832), I deduced them for myself. A list of R.A.'s and Decl.'s of poles of binary-star orbits was published by Dr. Doberck in 1882 (*Ast. Nach.* 2433), and a sequel to it by Mr. Gore in 1888 in a paper on "The Position of the Planes of Binary Stars" (*Jour. Liv.* A.S. vol. vi.), of the existence of which I was not aware till I had finished my calculations. But nearly all the orbits here considered have been computed in more recent years.

The results were checked by graphic means with the help of a globe, the graphic results generally agreeing with the theoretical to within a degree or two. A globe is, of course, useful in all spherical trigonometrical work in clearing the ideas and showing at sight in what quadrant the angle corresponding to a given trigonometrical function should lie. I bought mine unmounted from the maker in its original simple state before the map and outer coating had been applied, and drew the necessary circles and points of reference upon it. Pencil marks can be written and rubbed out quite well upon the smooth white surface, or sponged off when many accumulate. In default of a spherical sector, spherical angles can be measured as arcs along great circles polar to their apices.

No.	Stars in order of Right Ascension.	R.A. and Decl. of star 1890. R.A.	Decl.	Galactic Long. and Lat. of star. Long.	Lat.	Period in Years.	Computer.
		h m s	° ′	°	°		
1.	Σ 3062	0 0 30	+57 49	84·5	− 4·5	104·6	See
2.	Σ 2	0 3 15	+79 7	88·1	+16·5	166·2	Glasenapp
3.	η Cassiop.	0 42 27	+57 14	90·1	− 5·5	{ 195·8 208·1	See Lewis
4.	36 Androm.	0 49 5	+23 2	92·1	−39·7	137·5	Lewis
5.	Σ 186	1 50 12	+ 1 18	122·6	−57·1	150·8	Glasenapp
6.	γ Androm.	1 57 8	+41 48	104·7	−18·8	54·8	Burnham
7.	Σ 228	2 7 0	+46 59	104·7	−13·3	88·7	Gore
8.	20 Persei	2 46 46	+37 46	115·6	−18·7	20·8	{ Glasenapp Burnham
9.	40 Eridani	4 10 13	− 7 49	168·5	−37·2	176·2	Glasenapp
10.	OΣ 82	4 16 29	+14 48	147·8	−23·1	158·4	Glasenapp
11.	β 883 = Lal. 9091	4 45 6	+10 53	155·7	−19·9	16·4	Glasenapp
12.	OΣ 149	6 29 34	+29 22	152·3	+10·5	85·9	Glasenapp
13.	Sirius	6 40 18	−16 34	194·6	− 7·9	51·1	Zwiers
14.	Σ 1037	7 5 57	+27 26	157·4	+17·0	15·0	Mädler
15.	9 Argûs	7 46 41	−13 36	199·6	+ 7·6	22·0	See
16.	ζ Cancri	8 5 54	+17 59	172·4	+26·4	59·1	Seeliger
17.	Σ 3121	9 11 22	+29 2	164·8	+43·9	34·0	See
18.	ω Leonis	9 22 34	+ 9 32	190·8	+39·9	116·2	See
19.	φ Ursæ Maj.	9 44 37	+54 35	127·2	+47·9	91·9	Glasenapp
20.	8 Sextantis	9 47 4	− 7 35	213·0	+35·2	93·9	Glasenapp
21.	ξ Ursæ Maj.	11 12 19	+32 9	160·5	+70·0	60·0	See
22.	ι Leonis	11 18 11	+11 8	215·3	+64·5	178·6	Everett
23.	OΣ 234	11 24 53	+41 55	132·1	+68·5	63·5	Gore
24.	OΣ 235	11 26 6	+61 41	105·0	+53·3	94·4	Doberck
25.	γ Centauri	12 35 27	−48 21	268·9	+14·4	88·0	See
26.	γ Virginis	12 36 5	− 0 58	266·8	+61·7	194·0	See
27.	42 Comæ Beren.	13 4 38	+18 7	307·4	+81·8	25·7	{ O. Struve & Doubiago
28.	OΣ 269	13 27 53	+35 29	42·9	+77·3	47·7	Gore
29.	β 612 = B.A.C. 4559	13 34 10	+11 18	310·0	+69·9	30·0	Glasenapp
30.	Σ 1785	13 44 6	+27 32	4·7	+76·2	125·5	Gore
31.	α Centauri	14 32 10	−60 23	283·2	− 0·5	81·2	Roberts—Se
32.	Σ 1879	14 40 51	+10 8	334·2	+57·2	146·9	Lewis
33.	OΣ 285	14 41 22	+42 50	40·6	+61·3	76·7	See
34.	ξ Boötis	14 46 19	+19 33	351·6	+60·6	128·0	See
35.	μ^2 Boötis	15 20 20	+37 46	27·8	+55·3	219·4	See
36.	η Cor. Bor.	15 18 40	+30 41	15·2	+55·8	41·6	Doberck
37.	OΣ 298	15 32 3	+40 12	31·5	+52·8	56·7	Celoria
38.	γ Cor. Bor.	15 38 7	+26 39	9·5	+51·0	73·0	See
39.	ξ Scorpii	15 58 19	−11 4	327·9	+28·9	95·9	Doberck
40.	σ Cor. Bor.	16 10 33	+34 8	22·2	+45·2	370·0	See
41.	ζ Herculis	16 37 8	+31 48	19·8	+39·2	35·0	See
42.	β 416 = B.A.C. 5825	17 11 28	−34 52	319·2	+ 1·1	33·0	See
43.	Σ 2173	17 24 45	− 0 59	350·0	+16·7	46·0	See
44.	μ^1 Herculis	17 42 7	+27 47	19·9	+24·6	48·7	Celoria
45.	70 Ophiuchi	17 59 54	+ 2 32	357·4	+10·5	88·4	Schur
46.	99 Herculis	18 2 54	+30 33	24·4	+21·3	54·5	See
47.	ζ Sagitt.	18 55 37	−30 2	334·0	−15·9	18·9	See
48.	γ Cor. Aust.	18 58 59	−37 13	327·2	−19·2	152·7	See
49.	Σ 2525	19 22 4	+27 6	28·5	+ 4·1	138·5	Gore
50.	β Delphini	20 32 33	+14 13	26·3	−16·7	27·7	See
51.	4 Aquarii	20 45 30	− 6 2	9·3	−30·1	126·7	See
52.	δ Equulei	21 9 7	+ 9 34	27·9	−26·7	11·45	See
53.	τ Cygni	21 10 24	+37 35	50·3	− 8·4	36·5	Burnham
54.	κ Pegasi	21 39 40	+25 8	45·9	−21·6	11·42	See
55.	85 Pegasi	23 56 25	+26 30	77·5	−35·1	24·0	See

A.N. = *Astronomische Nachrichten*; M.N. = *Monthly Notices*, I

Source.	R.A. and Decl. of N. Pole of Orbit. I. Inclination positive. R.A.	N. Decl.	II. Inclination negative. R.A.	N. Decl.	Galactic Long. and Lat. of Pole of Orbit. A. Pole of lesser Lat. Long.	Lat.	B Pole of greater Lat. Long.	Lat.	No.
	°	°	°	°					
. 3292	265	62	30	20	58	+31	294	+39	1.
. 3145	112	24	299	15	202	9	162	20	2.
. 355	274	60	42	18					
. vol. lv. 19	270	59	42	16	59	28	309	37	3.
. vol. li. 462	54	55	169	15	114	0	207	66	4.
. 246	326	52	267	51	244	2	45	29	5.
. vol. liv. 119	169	53	182	33	116	60	142	81	6.
e's Cat.	224	62	217	24	66	49	358	66	7.
and A. vol. xii. ay, June, and ick Obs. vol. ii.	149	47	177	22	138	52	198	76	8.
. 3357	126	29	170	35	162	34	150	71	9.
. 3193	48	57	254	28	290	1	17	35	10.
. 3119	59	37	261	16	308	11	6	24	11.
e's Cat.	132	45	73	8	340	20	143	41	12.
. 3336	65	12	325	37	235	12	331	24	13.
e's Cat.	186	30	227	9	338	51	150	85	14.
. 3297	129	64	194	84	90	33	119	37	15.
e's Cat.	119	29	123	7	184	23	160	28	16.
. 349	48	32	20	16	304	21	283	46	17.
. 3311	205	34	266	24	17	23	32	76	18.
. 3119	203	49	103	36	148	18	69	67	19.
. 3119	165	18	306	33	220	4	196	65	20.
. 3323	243	81	338	23	236	31	81	33	21.
. vol. lv. 440	102	41	43	30	143	19	301	25	22.
e's Cat.	248	65	327	0	63	38	206	40	23.
e's Cat.	341	58	166	2	255	1	223	55	24.
. 3339	300	18	83	23	331	4	205	9	25.
. 352	168	22	30	24	292	35	188	69	26.
e's Cat.	103	10	103	10	172	7	172	7	27.
. vol. lii. 550	82	45	70	34	316	7	132	7	28.
nd A. 466	7	5	222	26	263	58	5	62	29.
. vol. liii. 333	243	46	181	2	40	45	249	63	30.
. 3175 . vol. liv. 102	155	3	145	22	210	48	178	48	31.
. lvi. 33	159	62	78	49	128	7	112	49	32.
. 356	155	70	239	4	342	39	106	43	33.
. 3334	273	4	166	20	0	9	193	66	34.
. 3309	284	36	188	17	35	13	257	79	35.
e's Cat.	157	35	101	4	177	2	156	60	36.
e's Cat.	161	17	303	14	203	13	194	61	37.
. 376	5	62	21	50	268	0	277	12	38.
e's Cat.	173	7	130	15	179	33	227	64	39.
. 3339	181	44	282	4	4	0	112	72	40.
. 357	183	47	108	5	179	9	104	69	41.
. 372	108	10	30	48	175	11	283	16	42.
. 3311	340	26	1	24	239	30	259	36	43.
e's Cat.	175	66	114	31	156	25	100	50	44.
. 3231	314	50	60	46	57	2	296	9	45.
. 366	271	31	271	31	24	21	24	21	46.
. 355	261	34	211	70	25	30	80	46	47.
. 3323	95	4	131	68	353	3	114	37	48.
. vol. liii. 44	245	77	121	26	163	29	77	34	49.
. 357	245	10	9	3	353	36	268	59	50.
. 341	20	0	63	5	336	31	289	61	51.
. 3290	235	23	212	20	5	50	343	69	52.
k Obs. vol. ii.	17	36	271	15	9	15	276	27	53.
. 3285	83	60	105	48	120	16	137	22	54.
. 3339	63	66	155	24	109	12	178	58	55.

. = *Astronomical Journal*, A. and A. = *Astronomy and Astro-Physics*.

Summary.

If the sphere be divided into equal-surface zones of galactic latitude, the distribution of the poles of the orbits according to the above results would be as follows :

Number of Poles in each Zone.

Zone of Galactic Latitude.	A. When, for each Star, the orbit corresponding to the pole of lesser latitude is taken.	B. When, for each Star, the orbit corresponding to the pole of greater latitude is taken.	Mean of numbers in two preceding columns. $\frac{A+B}{2}$.
$0^\circ-11^\circ$	19	4	$11\frac{1}{2}$
12–23	13	5	9
24–37	13	11	12
37–53	8	11	$9\frac{1}{2}$
53–90	2	24	13

If we consider only stars lying not far from the Milky Way, say, for example, those whose galactic latitude is under 40°, then these numbers become :

Number of Poles in each Zone.

Zone of Galactic Latitude.	A.	B.	Mean of numbers in two preceding columns. $\frac{A+B}{2}$.
$0^\circ-11^\circ$	10	2	6
12–23	8	4	6
24–37	11	8	$9\frac{1}{2}$
37–53	5	7	6
53–90	1	14	$7\frac{1}{2}$

Kgl. Astrophysikalisches Observatorium zu Potsdam : 1896 *June.*

On the Corrections to the Right Ascensions of Stars derived from Observations of the Sun made at Greenwich during the years 1836–1895. By W. G. Thackeray.

If a comparison be made between the values of the proper motions in right ascension for the fundamental stars as given by Professor Newcomb in his standard right ascensions, and by Dr. Auwers from his re-reduction of Bradley's observations, it will be found that Professor Newcomb's proper motions are on the average nearly $^{s}\!\cdot001$ larger than those given by Dr. Auwers. It would therefore seem that the epoch correction of one or other